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**PART-I**

**Chapter 1: ECOLOGY**

<p><b>ECOLOGY</b></p>	<ul style="list-style-type: none"> <li>Defined "<b>as a scientific study of the relationship of the living organisms with each other and with their environment.</b>"</li> <li>The classical texts of the Vedic period such as the <b>Vedas, the Samhitas, the Brahmanas</b> and the <b>Aranyakas-Upanishads</b> contain many references to ecological concepts</li> <li>The Indian treatise on medicine, the <b>Caraka-Samhita</b> and the surgical text <b>Susruta-Samhita</b>.</li> <li>Contain <b>classification of animals</b> on the basis of habit and habitat, land in terms of nature of soil, climate and vegetation; and description of plants typical to various localities.</li> <li><b>Caraka-Samhita</b> contains information where air, land, water and seasons were indispensable for life and that polluted air and water were injurious for health.</li> <li><b>The environment</b> is defined as '<b>the sum total of living, non-living components</b>'; influences and events, surrounding an organism.</li> </ul>
<p><b>Components of Environment</b></p>	<ol style="list-style-type: none"> <li><b>Abiotic</b>– Energy, Radiation, TEMP, Water, etc.</li> <li><b>Biotic</b>- plants, animals, man, DECOMPOSER ETC.</li> </ol> <ul style="list-style-type: none"> <li>Diesel engine exhaust fumes can cause cancer, humans" and it belong to the same potentially deadly category as asbestos, arsenic and 'mustard gases. <b>World Health Organization (WHO)</b></li> <li>If a marine fish is transferred to a fresh water environment, it will not be able to Survive.</li> </ul>
<p><b>Levels of Organisation of Ecology</b></p>	<p><b>Six main levels of organisation</b> of ecology are:</p> <ol style="list-style-type: none"> <li><b>Individual</b>- Organism is an individual living being that has the <b>ability to act or function independently.</b></li> <li><b>Population</b>-Population is a group of organisms usually of the <b>same species</b>, occupying a defined area during a specific time,</li> <li><b>Community</b>- Communities in most instances are named after the <b>dominant plant form</b> (species). A community is not fixed or rigid; communities may be large or small.</li> </ol>
<p><b>Types of Community-</b></p>	<p>On the basis of size and degree of <b>relative independence</b> communities may be divided into <b>two types-</b></p> <p><b>(a) Major Community</b></p> <ul style="list-style-type: none"> <li>➤ These are <b>large-sized, well organized and relatively independent.</b> They depend only on the sun's energy from outside and are independent of the inputs and outputs from adjacent communities.</li> <li>➤ E.g: <b>tropical ever green forest in the North-East</b></li> </ul> <p><b>(b) Minor Communities</b></p> <ul style="list-style-type: none"> <li>➤ These are dependent on <b>neighbouring communities</b> and are often called <b>societies.</b> They are <b>secondary aggregations</b> within a major community and are not therefore completely independent units as far as energy and nutrient dynamics are concerned.</li> <li>➤ e.g: <b>A mat of lichen</b> on a cow dung pad.</li> <li>➤ The environmental factors determine the characteristic of the community</li> </ul>

	<p>as well as the pattern of organisation of the members in the community</p> <ul style="list-style-type: none"> <li>➤ The characteristic pattern of the community is termed as structure which is reflected in the roles played by various population, their range, the type of area they inhabit, the diversity of species in the community and the spectrum of interactions between them.</li> </ul> <p>4. <b>Eco-System</b>-An ecosystem is defined as a <b>structural and functional unit of biosphere</b> consisting of community of living beings and the physical environment, both interacting and exchanging materials between them.</p> <ul style="list-style-type: none"> <li>➤ It includes <b>plants, trees, animals, fish, birds, micro-organisms, water, soil, and people.</b></li> <li>➤ When an ecosystem is healthy (i.e. sustainable) it means that all the elements live in <b>balance</b> and are capable of reproducing themselves</li> </ul>
<p><b>Components of Ecosystem</b></p>	<p>The components of the ecosystem is <b>categorised into abiotic of non-living and biotic of living</b> components. Both the components of ecosystem and environment are same.</p>
<p><b>1. Abiotic Components</b></p>	<ul style="list-style-type: none"> <li>➤ The <b>inorganic and non-living</b> parts of the world.</li> <li>➤ Consists of <b>soil, water, air, and light energy</b> etc.</li> <li>➤ Involves a large number of <b>chemicals</b> like oxygen, nitrogen etc. and physical processes including volcanoes, earthquakes, floods, forest fires, climates, and weather conditions.</li> <li>➤ Abiotic factors are the <b>most important determinants</b> of where and how well an organism exists in its environment. Although these factors interact with each other, one single factor can-limit the range of an organism.</li> </ul> <p>a) <b>Energy</b></p> <ul style="list-style-type: none"> <li>➤ Energy from the sun is essential for <b>maintenance of life</b>. Energy determines the <b>distribution of organisms</b> in the environment.</li> </ul> <p>b) <b>Rainfall</b></p> <p>c) <b>Temperature</b></p> <ul style="list-style-type: none"> <li>➤ Temperature is a <b>critical factor</b> of the environment which greatly <b>influences survival of organisms</b>. Organisms can tolerate only a certain range of temperature and humidity.</li> </ul> <p>d) <b>Atmosphere</b></p> <ul style="list-style-type: none"> <li>➤ It is made up of <b>21% oxygen, 78% nitrogen, 0.038% carbon dioxide</b> and other <b>inert gases (0.93% Argon, Neon etc).</b></li> </ul> <p>e) <b>Substratum</b></p> <ul style="list-style-type: none"> <li>➤ Land is covered by soil and a wide variety of <b>microbes, protozoa, fungi and small animals</b> (invertebrates) thrive in it.</li> </ul> <p>f) <b>Materials:</b></p> <p><b>(i) Organic compound</b></p> <p>Such as <b>proteins, carbohydrates, lipids, humic substances</b> are formed from</p>

inorganic compound on decomposition.

**(ii) Inorganic compound**

- ✓ Such as **carbon, carbon dioxide, water, sulphur, nitrates, phosphates, and ions** of various metals are essential for organisms to survive.

**g) Latitude and altitude**

- Latitude has a **strong influence on an area's temperature**, resulting in change of climates such as polar, tropical, and temperate. These climates determine different **natural biomes**.
- From sea level to highest peaks, **wild life is influenced by altitude**. As the altitude increases, the air becomes colder and drier, affecting wild life accordingly. (wild life decrease as altitude increase)

**2. Biotic Components**

- Biotic components include **living organisms** comprising plants, animals and microbes and are classified according to their functional attributes into producers and consumers.
- **Primary producers – Autotrophs** (self-nourishing) Primary producers are basically **green plants** (and certain bacteria and algae). They synthesise carbohydrate from simple inorganic raw materials like carbon dioxide and water in the presence of sunlight by the process of photosynthesis for themselves, and supply indirectly to other non-producers.
- In terrestrial ecosystem, producers are basically **herbaceous and woody plants**, while in aquatic ecosystem producers are various species of microscopic algae.
- b) Consumers – Heterotrophs or phagotrophs** (other nourishing)
  - Consumers are **incapable of producing their own food** (photosynthesis).
  - They depend on organic food derived from plants, animals or both.
  - Consumers can be divided into **two broad groups**
- i. Macro consumers-** They feed on plants or animals or both and are categorised on the basis of their food sources.
  - **Herbivores** are **primary consumers** which feed mainly on plants e.g. cow, rabbit.
  - **Secondary consumers** feed on **primary consumers** e.g. wolves.
  - **Carnivores** which feed on **secondary consumers** are called **tertiary consumers** e.g. lions which can eat wolves.
  - **Omnivores** are organisms which consume both plants and animals e.g. man.
- ii. Micro consumers- Saprotrophs** (decomposers or osmotrophs)
  - They are **bacteria and fungi** which obtain energy and nutrients by decomposing dead organic substances (**detritus**) of plant and animal

	<p>origin.</p> <ul style="list-style-type: none"> <li>➤ The products of decomposition such as <b>inorganic nutrients</b> which are released in the ecosystem are reused by producers and thus recycled.</li> <li>➤ <b>Earthworm and certain soil organisms</b> (such as nematodes, and arthropods) are detritus feeders and help in the decomposition of organic matter and are called <b>detrivores</b>.</li> </ul>
Classification of Eco-system	<p>1. <b>Natural Ecosystem-</b></p> <ul style="list-style-type: none"> <li>➤ <b>Terrestrial-</b> Forests, Grasslands, Deserts</li> <li>➤ <b>Aquatic-</b> Fresh Waters, Saline Waters, Marine Waters</li> </ul>
Ecotone	<ul style="list-style-type: none"> <li>➤ <b>Azone of junction</b> between two or more diverse ecosystems. For e.g. <b>the mangrove forests</b> represent an ecotone between marine and terrestrial ecosystem.</li> </ul>
Characteristics of Ecotone	<ul style="list-style-type: none"> <li>➤ It may be <b>very narrow or quite wide</b>. It has the <b>conditions intermediate</b> to the adjacent ecosystems. Hence it is a zone of tension.</li> <li>➤ It is <b>linear</b> as it shows <b>progressive increase in species</b> composition of one in coming community and a simultaneous decrease in species of the other out going adjoining community.</li> <li>➤ A well developed ecotones contain <b>some organisms which are entirely different</b> from that of the adjoining communities.</li> <li>➤ Sometimes the number of species and the population density of some of the species is much greater in this zone than either community. This is called <b>edge effect</b> For example the density of birds is greater in the mixed habitat of the ecotone between the forest and the desert.</li> </ul>
Niche	<ul style="list-style-type: none"> <li>➤ A description of all the biological, physical and chemical factors that a species needs to survive, stay healthy and reproduce.</li> <li>➤ NO two species have <b>exact identical niches</b>. Niche plays an important role in <b>conservation</b> of organisms.</li> </ul>
Types of Niche	<ol style="list-style-type: none"> <li>1. <b>Habitat niche</b> - where it lives</li> <li>2. <b>Food niche</b> - what it eats or decomposes &amp; what species it competes with</li> <li>3. <b>Reproductive niche</b> - how and when it reproduces.</li> <li>4. <b>Physical &amp; chemical niche</b> - temperature, land shape, land slope, humidity &amp; other requirement.</li> </ol>
Biome	<ul style="list-style-type: none"> <li>➤ The <b>terrestrial part</b> of the biosphere is divisible into enormous regions called <b>biomes</b>, which are characterized, by climate, vegetation, animal life and general soil type.</li> <li>➤ No two biomes are <b>alike</b>.</li> <li>➤ The most important climatic factors are <b>temperature and precipitation</b>.</li> </ul> <ol style="list-style-type: none"> <li>1. <b>Tundra- Northern most region</b> adjoining the ice bound poles. <ul style="list-style-type: none"> <li>➤ Devoid of trees except <b>stunted shrubs</b> in the southern part of tundra biome, ground flora includes <b>lichen, mosses and sedges</b>.</li> <li>➤ The typical animals are <b>reindeer, arctic fox polar bear, snowy owl, lemming, arctic hare and ptarmigan</b>. Reptiles and amphibians are almost absent</li> </ul> </li> </ol>